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AUTHOR Riney, Timothy J.; Takada, Mari
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ABSTRACT

A study investigated the substitution of the Japanese flap for English liquids /r/ and /l/ by 11 Japanese students in their first and fourth years of college. Phonological patterns were examined at the two different stages, in reading vs. spontaneous oral language tasks, and for word-initial singleton vs. word-initial cluster environments. The number of obligatory instances of /r/ and /l/ for each speaker for three reading tasks at the two stages combined ranged from 140 to 159 depending on the speaker. Individuals' Japanese flap substitutions varied from 0-86 percent. Most had fewer flap substitutions in the fourth year, and more flaps in spontaneous than in reading tasks. All substituted flaps more often for /l/ than for /r/. Flaps were substituted more frequently for singleton liquids than for liquids in clusters. A negative correlation was found between global foreign accent and percentage of Japanese flap substitutions. Contains 15 references. (MSE)

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Timothy J. Riney and Mari Takada

The Japanese Flap in EFL: Variability and Accent

Timothy J. Riney
International Christian University
Tokyo

Mari Takada
Georgetown University
Washington, DC

In this study we assess the substitution of the Japanese flap (/ɾ/) for English liquids (/r/ and /l/) by 11 Japanese students during their first and fourth years (T1, T2) of college. Percentage of Japanese flap substitutions are calculated at T1 vs. T2, for target /ɾ/ vs. /l/, in reading vs. spontaneous tasks, and for word-initial singleton (#_V) vs. word-initial cluster environments (#C_V, #CC_V). The number of obligatory instances of /r/ and /l/ for each speaker for 3 reading tasks and T1 and T2 combined ranged from 140 to 159 (depending on the speaker). Individuals' Japanese flap substitutions varied from 0% to 86%. Most speakers had fewer flap substitutions at T2 than at T1 and more flaps in the spontaneous tasks than in the reading tasks. All speakers substituted flaps more often for /l/ than for /r/. Flaps were substituted significantly ($p <= .05$) more often for singleton liquids than for liquids in clusters. A negative correlation was found between global foreign accent and percentage of Japanese flap substitutions ($r = -.76$, $df = 20$, $p < .001$).

Researchers (e.g., Goto, 1971) in second language acquisition have for some time recognized the difficulty that the English liquids, /r/ and /l/, pose for Japanese speakers. The English liquids have probably received more attention than any other consonants in the literature investigating Japanese ESL pronunciation (Riney & Anderson-Hsieh, 1993). In prevocalic position, English /l/ is usually a voiced, alveolar, lateral approximant; /r/ is usually described as a voiced, alveolar (sometimes retroflexed) approximant (Ladefoged, 1993). Japanese has no consonant similar to either English liquid. The Japanese liquid (/ɾ/) is an apico-alveolar flap or tap that is transliterated in the roman alphabet as "r." The Japanese sound occurs only prevocalically and intervocalically, and it contrasts with /d/ but not with any lateral or retroflex phones (Price, 1981). The flap that occurs in American English, however, is widely considered to be an allophonic variant not of /r/, but of /t/ and /d/ (as in *kitty* and *kiddy*). Thus, the phonological roles and distributions of the Japanese and American flaps are quite different.

The Japanese Flap

If the Japanese flap has a phonetic counterpart in American English, it is the intervocalic flap. Vance (1987) described the Japanese flap as "essentially the same sound" (p. 27) as the flaps in Spanish and in Russian, and the intervocalic flap in American English *city*. Yamada and Tohkura (1992) classified the Japanese sound as "a stop, or flap, depending on its vowel context" (p. 377). Laver (1994) categorized flaps and taps as "flapped stops" and "tapped stops" (pp. 224–227). In her comparative study of flaps in intervocalic position in American English and in Japanese (the only position in which taps or flaps freely occur in both languages), Price (1981) determined that the Japanese flap and the American English flap, whereas operating in different phonological systems, are similar articulatorily and acoustically. The study by Price was based on transcriptions, spectral analysis, waveform patterns, and perceptual evidence involving judgments by a trained phonetician and native American English speakers making judgments on Japanese productions and vice versa. Price found that the "allophonic variability" of the Japanese flap was unclear (p. 8).

Thus, with regard to English and Japanese liquids, at a phonetic level of analysis we are dealing with three different sounds. In American English, /l/ is a lateral and /r/ is a rhotic. The Japanese liquid is a flap or tap—a type of stop (Ladefoged & Maddieson, 1996).

We hope that the results of this investigation may eventually contribute to the understanding of how learning and acquisition are affected by degrees of similarity and difference between the items a learner possesses and those items the learner intends to acquire. In a recent review of related literature, Major and Kim (1996) have noted that many researchers "have investigated the relationship between phonological similarity / dissimilarity (variously called new or different phenomena) and difficulty or order of acquisition" (pp. 467–68). According to Oller and Ziahosseiny (1970), "wherever patterns are minimally distinct in form or meaning in one or more systems, confusion may result" (p. 186). According to Wode (1983), L1-L2 transfer requires "crucial similarity measures" (p. 180; as cited in Major & Kim, 1996) between the L1 and L2 items. In a similar vein, Flege (1987) used "equivalence classification" to denote that situation in which a speaker perceived L1 sounds to be the same as the L2 sounds, making the L2 sounds more difficult to acquire than new, different, or dissimilar sounds. Major and Kim proposed "The Similarity Differential Rate Hypothesis" (SDRH): "An L2 phenomenon that is dissimilar to an L1 phenomenon is acquired faster than an L2 phenomenon that is similar to this same L1 phenomenon" (p. 474).

The Japanese Flap

This study follows Riney and Flege (1998) and Riney and Takagi (in press) in investigating the relationship between global foreign accent and discrete features of accent and changes over time. Measured here are the percentage of Japanese flap substitutions for /r/ and /l/ at 2 times, separated by an interval of 42 months, produced by 11 Japanese EFL (JEFL) speakers during their first year (T1) and fourth year (T2) of college. Five age-matched native English (NE) speakers served as the control group. Global foreign accent scores of the same 16 speakers are taken from the first experiment of Riney and Flege (1998).

Riney and Takagi (in press) found, among the same group of Japanese speakers, a positive correlation between global foreign accent and voice onset time. This linkage of global and discrete measures of accent supported an earlier claim by Major (1987) that global foreign accent and voice onset time are related. Using the same group of speakers as Riney and Flege (1998) and Riney and Takagi (in press), we investigate further the relation between global and discrete measures of foreign accent among a single group of speakers. In the current study, however, the focus is on segmentals and, in particular, English and Japanese liquids.

The literature reviewed above motivated the following central hypothesis of this study:

> There will be a negative correlation between speakers' global foreign accent and their percentage of Japanese flap substitutions. The more the accent is like that of a native speaker of English, the fewer the Japanese flap substitutions; the less the accent is like that of a native speaker of English, the more the flap substitutions.

In addition, we were interested in exploring the following four general questions:

1. Do JEFL speakers' flap substitutions diminish over time?
2. Do JEFL speakers' flap substitutions vary according to the target liquid (/r/ vs. /l/)?
3. Do JEFL speakers' flap substitutions vary according to the task (reading vs. spontaneous)?
4. Do JEFL speakers' flap substitutions vary according to phonological environment (singleton vs. cluster)?

Method

Speakers

The 16 speakers (11 JEFL and 5 NE) used for this project, the same as described in detail by Riney and Flege (1998), will be described only briefly here. The 11 JEFL speakers (8 females, 3 males) were students at International Christian University (ICU) in Tokyo, a university which uses two languages of instruction, Japanese and English. Most of the JEFL speakers had begun their study of English at about age 13 in Japanese public schools. At T1 (spring, 1992) the 11 JEFL speakers were first year college students aged 18 to 20 years, and at T2 (fall, 1995) they were college seniors. The 11 JEFL speakers had similar TOEFL scores first year (range: 437–497) and second year (range: 490–567) but differed in other respects, including pre-university schooling. In addition, between T1 and T2, 4 speakers spent an academic year at universities abroad (2 in California, 1 in Holland, and 1 in Mexico); 4 others made short trips abroad. Riney and Flege (1998) determined that the accents of 3 of the 11 Japanese had significantly improved between T1 and T2; 2 of these 3 had spent a year between T1 and T2 in California.

The control group of 5 NE speakers (3 females, 2 males; aged 20–23) had all been born and raised in California, where they graduated from high school as monolingual speakers of English. At the time of the data collection (May, 1996), all NE speakers were at ICU studying Japanese as one-year exchange students from universities in California. The T1 and T2 data collections of these NE speakers were done at an interval of 2 weeks. It was assumed that the phonetic productions of NE speakers in their early 20s separated by an interval of 2 weeks would not differ significantly from productions separated by an interval of 42 months, which was the interval for the JEFL speakers. Except for the dates of T1 and T2, the NE and the JEFL speakers were recorded in an identical manner in a soundproof room at ICU.

Speech materials and procedures

All 32 speech samples (16 speakers x 2 times) were recorded using a Sony TC–1290 monaural tape recorder. Speakers' tasks included (1) the reading of a list of 84 words, 25 of which were used for this study; (2) the reading of a list of 15 sentences, all of which involved prevocalic liquids and

were used for this study and 5 of which were used for the global foreign accent study of Riney and Flege (1998); (3) the reading of a paragraph; and (4) the spontaneous response to the following prompt: "Tell me about one of the most dangerous moments in your life." It is known that context may affect L1 and L2 pronunciation, and that English liquids vary across dialects and phonological environments. To help control for this variance we investigated Japanese flap substitutions in only two environments, both prevocalic: (a) for word-initial singleton /r/ and /l/, and (b) for /r/ and /l/ in word-initial clusters.

In order to test our central hypothesis and determine if there was a correlation between global foreign accent and Japanese flap substitutions it was of course necessary to have measurements of both. The second author (MT), a native speaker of Tokyo Japanese, did the assessments of the Japanese flap substitutions for all JEFL speakers and 3 of 5 NE speakers. The first author (TR), a native speaker of English, did the assessments of the other 2 NE speakers of English. All 16 speakers were assessed binaurally via headphones. The assessment task was simply to identify whether or not a Japanese tap or flap had been substituted for English /r/ and /l/, and, in the case of the NE speakers, to confirm that no other English phonemes were being substituted for liquids and that no English liquids were being deleted in the prevocalic environments under investigation.

The global foreign accent scores of the 16 speakers were obtained from Riney and Flege (1998). For the determination of the global foreign accent scores in that study, 5 native-English listeners (raters) from different areas of the United States each heard, in counterbalanced order, a different randomization of the stimuli and rated each of the 5 sentences on a 9-point scale. For each of 5 listeners, the final 3 of 4 judgments of each sentence by each listener were averaged; then the ratings of all 5 listeners were averaged to obtain a robust estimate of each speaker's accent. These 11 JEFL speakers' global foreign accent scores were then correlated with the percentage of Japanese flap substitutions in the current study.

Results

As expected, there were no Japanese flap substitutions for English liquids and no liquid deletions (in word initial, prevocalic position) among the 5 speakers of the NE control group. The results for the 11 JEFL speakers are shown in Table 1 and in Figures 1, 2, 3, 4, and 5. Table 1 provides a cross-reference for all variables and all speakers. The number of obligatory

instances for English liquids (65) was the same for the three reading tasks (word list, sentence list, and paragraph) at each time (T1 and T2). The number of obligatory instances in the spontaneous speech task (range: 10 to 29) varied due to the lexical variation in the different stories that the speakers told.

TABLE 1

Percentages of Japanese Flaps Substituted for English Liquids

	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11
Time 1	3.9	27.0	11.1	26.4	12.0	17.1	20.0	0	4.1	30.4	90.1
Time 2	1.2	28.2	7.4	10.1	6.4	10.8	25.0	0	19.2	5.1	82.2
For /r/	0	18.8	4.6	8.1	6.9	9.8	19.5	0	9.5	8.6	76.5
For /l/	5.8	37.8	15.2	30.8	12.1	19.4	26.4	0	15.2	27.3	98.4
Spontaneous	3.6	31.0	8.7	14.3	26.1	21.4	37.9	0	15.0	27.8	92.9
Reading	2.3	26.9	9.2	18.5	6.2	13.0	19.2	0	11.5	15.5	85.4
Singleton	5.6	32.9	19.1	28.2	18.9	26.2	45.8	0	24.6	32.8	92.4
Cluster	0	23.3	1.2	8.8	0	3.8	3.4	0	3.4	3.8	80.8

Note. For Time 1 vs. Time 2, all other variables are combined; for /r/ vs. /l/, all other variables are combined; for the spontaneous story vs. the reading tasks, all other variables are combined; and for word-initial singleton environments (#_V) vs. word-initial cluster environments (#C_V and #CC_V), all other variables are combined.

Figures 1, 2, 3, and 4 are based on Table 1. Figure 1, which addresses the first general question posed above, shows the percentage of Japanese flap substitutions produced by all JEFL speakers at T1 and T2. (Recall that T1 and T2 were separated by 42 months for the JEFL speakers.) Figure 1 combines both liquid types (/r/ and /l/), both task-types (spontaneous and reading) and both onset types (singleton and cluster). Each of the 22 data points in Figure 1 represents the percentage of Japanese flap substitutions for one of the 11 JEFL speakers at one point in time. At T1 each of the 11 data points is based on from 66 to 76 observations; at T2 from 72 to 85 observations. The T2 numbers are slightly larger because the spontaneous stories were longer at T2 than at T1. In most cases 65 of the tokens at each data point were from the reading tasks, but this number was slightly less

when speakers skipped or misread words, or the recording was unclear, slightly reducing the number of tokens that could be counted.

Speaker J8, like the NE control group (not shown in the figures), had no Japanese flap substitutions at T1 or T2. Speaker J1 had only 3.9% Japanese flap substitutions at T1 and 1.2% at T2. For the other 9 JEFL speakers the percentages were larger. Seven speakers (J11, J10, J4, J6, J5, J3 and J1) had fewer flap productions at T2 than at T1. Two speakers (J7 and J9) had more at T2 than at T1, and two (J2 and J8) changed very little or not at all. Speaker J11 had by far the most with 96.1% at T1 and 82.2% at T2.

The purpose of this part of the study was to investigate whether there was any change in Japanese flap substitutions for liquids between T1 and T2. For the NE control group, which had 0% Japanese flap substitutions at T1 and T2, there was no difference. Because speaker J8 performed like a NE speaker and speaker J1 like a near-NE speaker, we decided to remove these two speakers from the JEFL group before statistical analysis. For them no change over time could be observed because there was little to no room for improvement between T1 and T2, which was the focus of this part of the study. Even with speakers J1 and J8 removed, however, a *t*-test determined that for the remaining group of 9 JEFL speakers there was no significant difference between T1 and T2 ($p <= .34$, one tail).

Figure 2, which addresses the second general question posed above, shows the percentage of Japanese flap substitutions for obligatory /r/ vs. /l/. The English liquids are obligatory because they were present 100% of the time in the English of the NE control group. The percentages shown here combine substitutions from both times, both task-types, and both onset types. Each of the 22 data points in Figure 2 represents the percentage of Japanese flap substitutions of one JEFL speaker at one point in time for target English /r/ or /l/. For /r/ this percentage at each data point is based on 80 to 89 observations; for /l/ it is based on 58 to 74 observations. A *t*-test determined that even with speakers J1 and J8 (discussed above) removed from the JEFL group, there was no significant difference between the percentages of substitutions for /r/ vs. /l/ for the remaining 9 JEFL speakers ($p <= .13$, one-tail).

Figure 3, which addresses the third general question posed above, shows the percentage of Japanese flap substitutions obtained from the 11 JEFL speakers for the two task types: reading vs. spontaneous. The percentages shown here combine Japanese flap substitutions from both times, both liquid types, and both onset types. Each of the 11 data points of the reading tasks in Figure 3 is based on 128 to 130 observations of obligatory instances of an English liquid. Each of the 11 data points for the

FIGURE 1
Japanese Flap Substitutions for English Liquids: Time 1 vs. Time 2

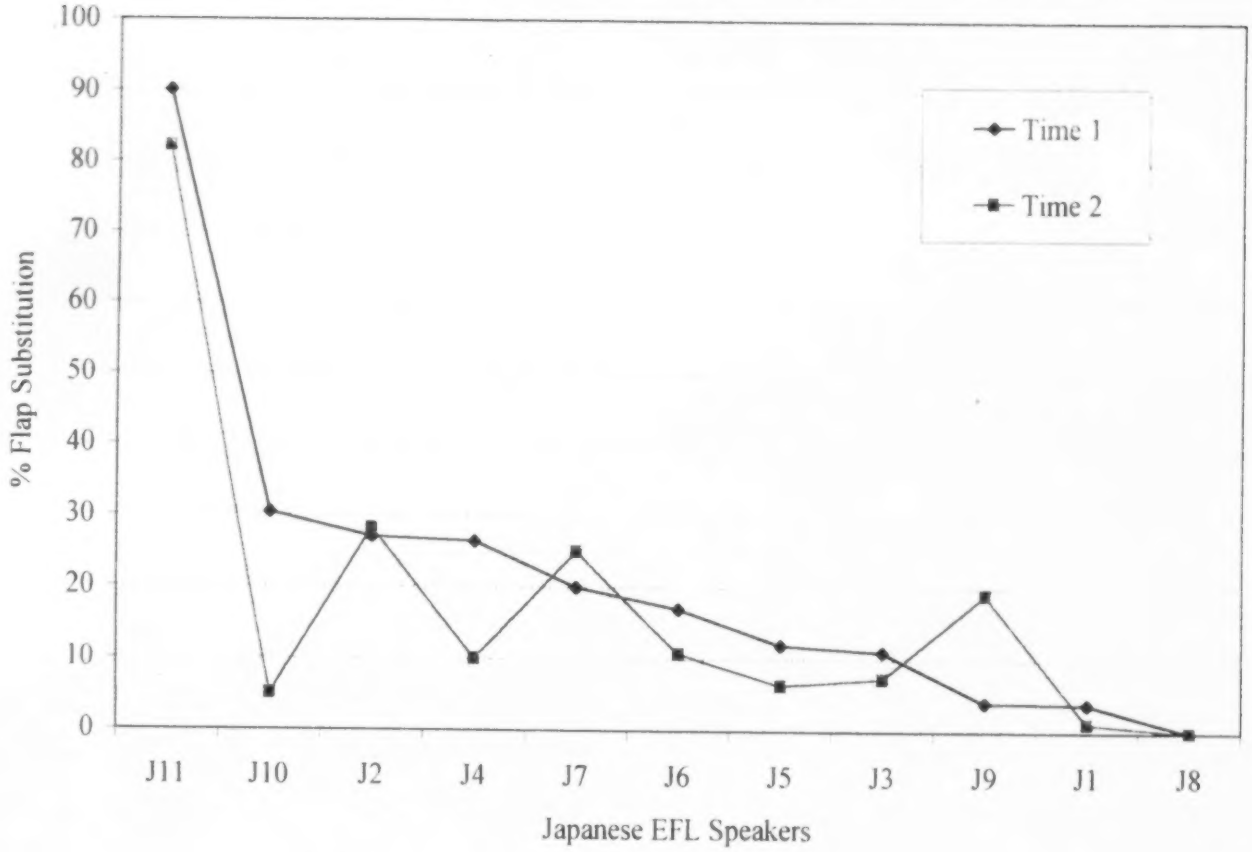


FIGURE 2
Japanese Flap Substitutions for English Liquids: /l/ vs. /r/

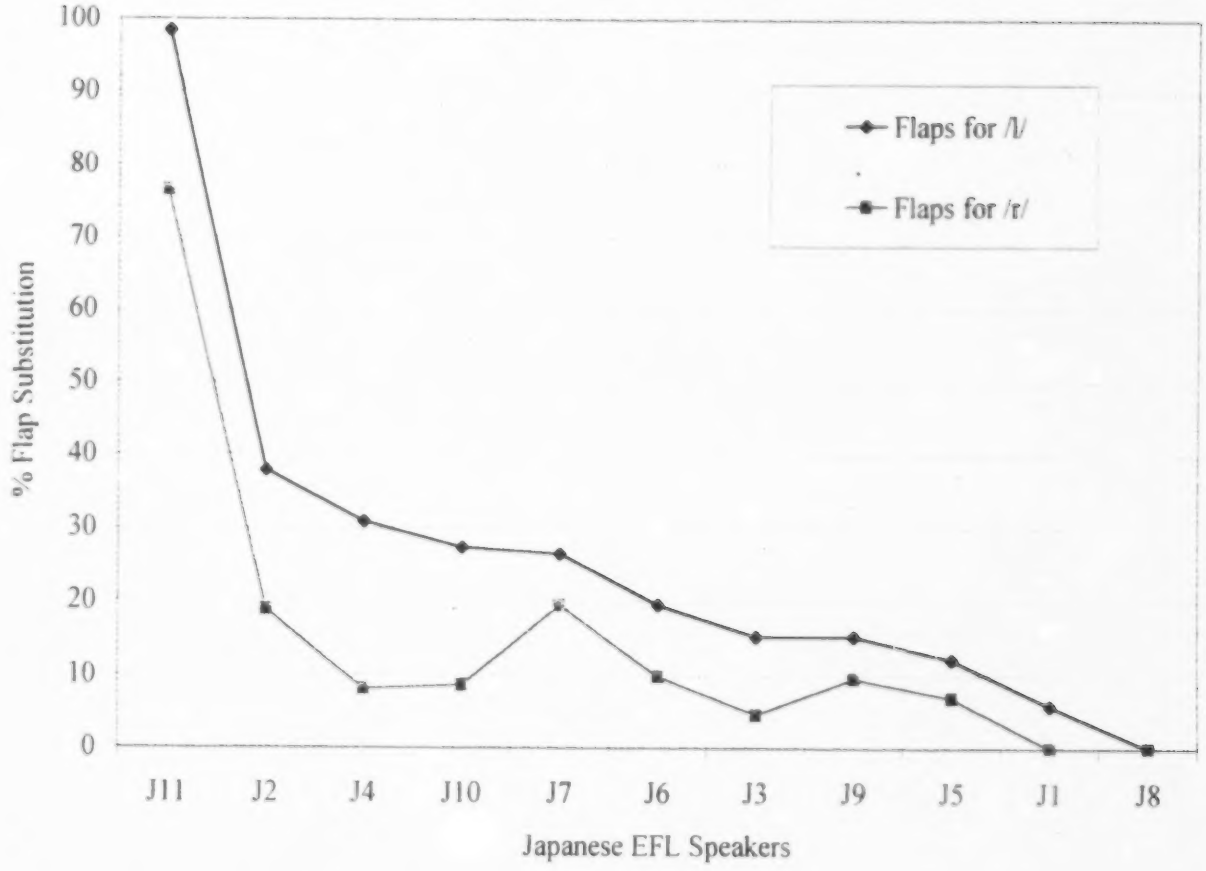


FIGURE 3
Japanese Flap Substitution for English Liquids: Spontaneous vs. Reading

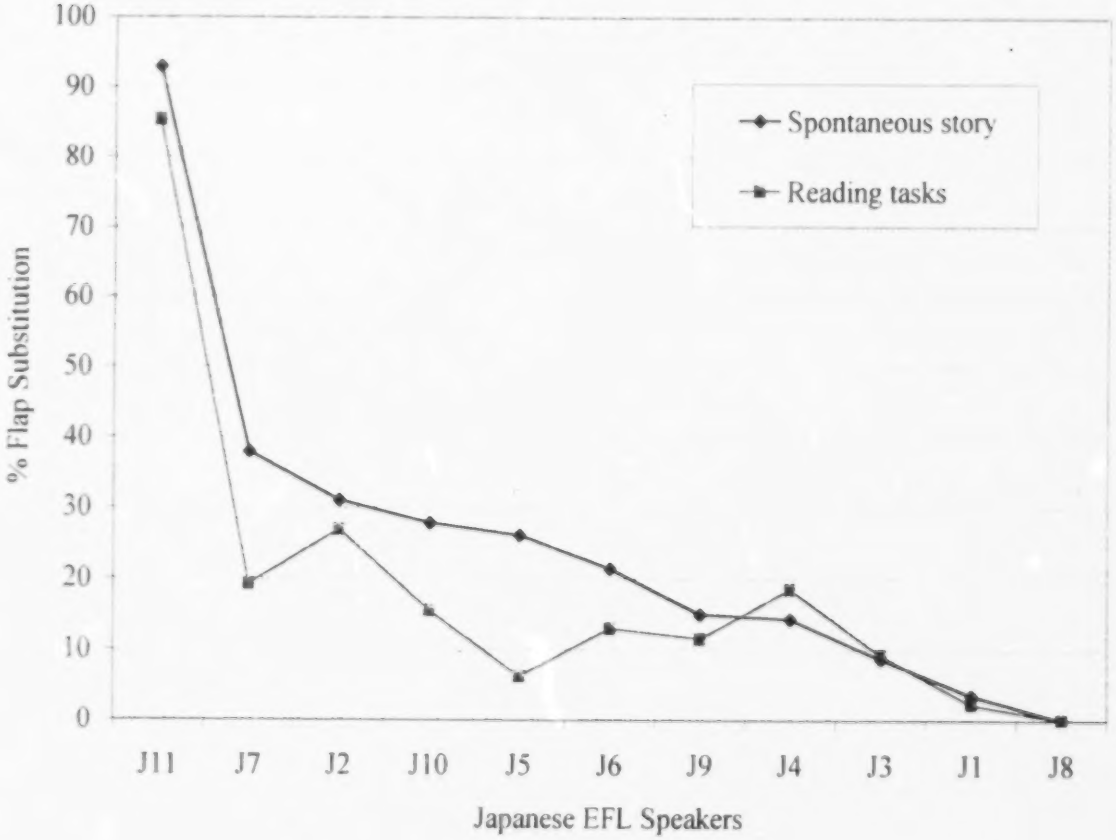
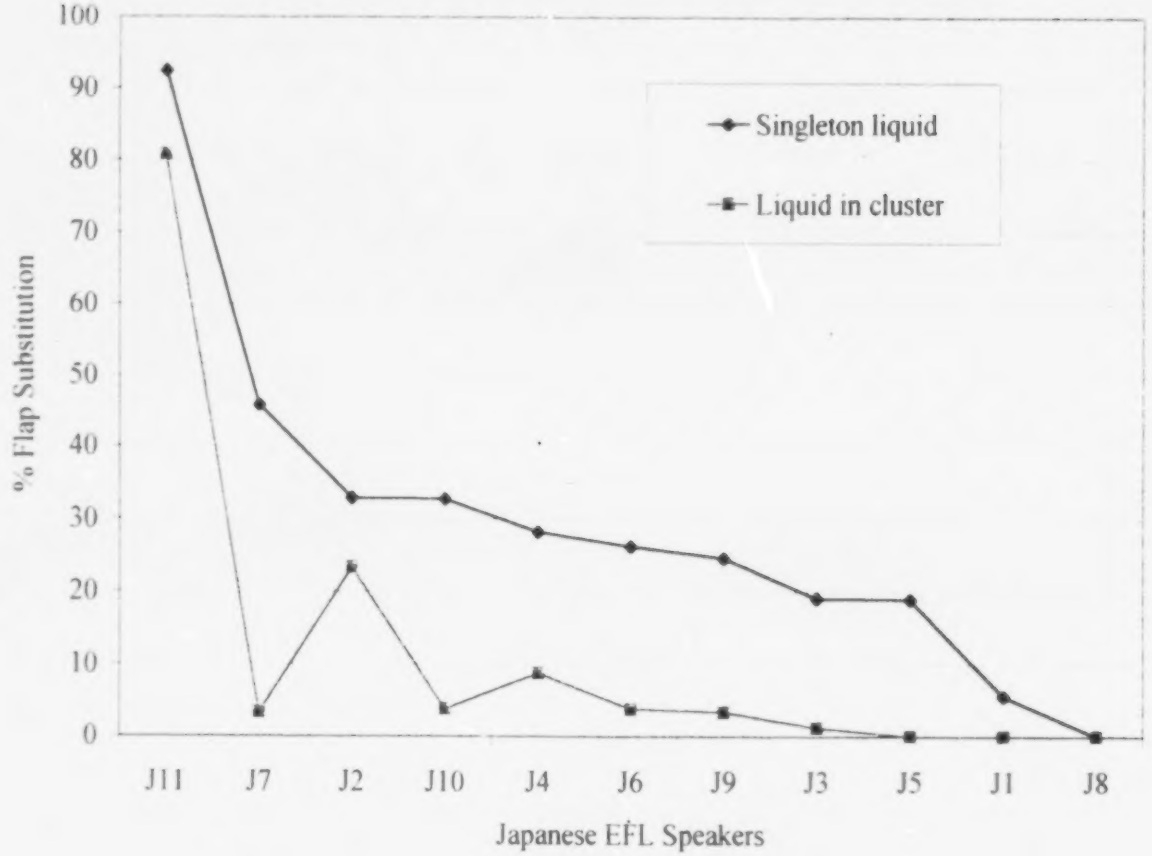


FIGURE 4
Japanese Flap Substitution for English Liquids: Singleton vs. Cluster



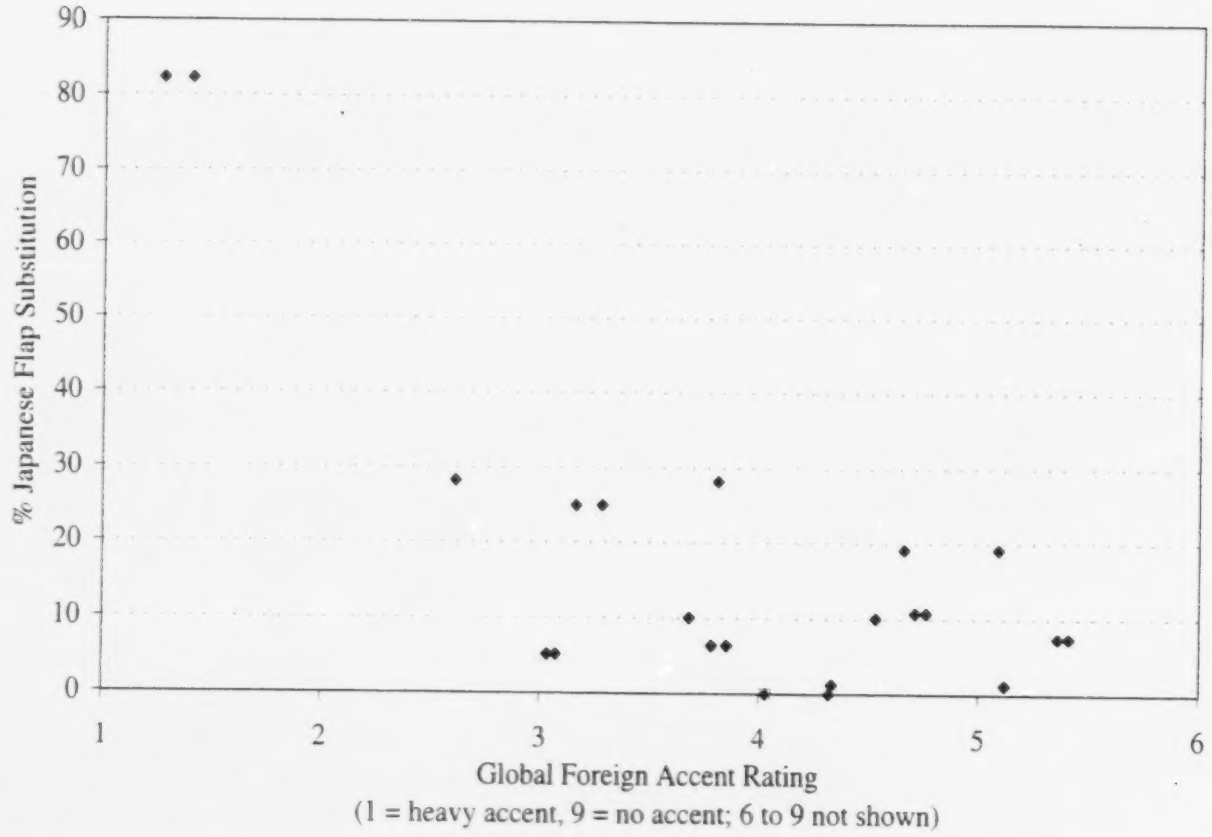
spontaneous task is based on 10 to 29 observations (depending on the speaker and length of story). The number of obligatory instances in the spontaneous stories varied because each speaker told a different story and even the same speaker told a different story at T1 and T2. Although the stories were different, the phonological environments investigated were obligatory ones for /r/ and /l/ in that they were all in the word initial, prevocalic environment, an environment in which no NE speaker from the NE control group deleted an /r/ or an /l/ or substituted any other sound for /r/ or /l/.

As noted above, speakers J1 and J8 produced the fewest flaps. Speaker J3, who had the third fewest flaps, had about the same percentage for the two task types, reading and spontaneous. Speaker J4 produced more flaps in the reading tasks than in the spontaneous task. The other 7 JEFL speakers produced more flaps in the spontaneous task than in the reading tasks. For the group of 9 JEFL speakers (excluding J1 and J8), a *t*-test determined that the percentage of Japanese flap substitutions for the two task types, reading and spontaneous, did not differ significantly ($p <= .26$, one-tail).

Figure 4, which addresses the fourth general question posed above, shows the percentage of Japanese flap substitutions for word-initial singleton liquids (#_V) vs. liquids in word-initial clusters (#C_V, #CC_V). The percentages shown here combine Japanese flap substitutions from both times, from both liquid types, and from both task types. For the singleton (#_V) environment, each of the 11 data points in Figure 4 is based on 61 to 74 observations. For the cluster environments each of the 11 data points is based on 52 to 67 observations for the #C_V environment combined with 22 to 25 for the #CC_V environment. (Because there was no difference between these two cluster environments, they were combined.) One notes in Figure 4 that (except for speakers J1 and J8), a rather large difference exists in the frequency of Japanese flap substitutions in the two environments. A *t*-test determined that for the group of 9 JEFL speakers the difference between the two was significant at the .05 level.

Finally, with regard to the central hypothesis of this study, Figure 5, a scattergram, shows the relationship between global foreign accent and Japanese flap substitutions ($r = -.76$, $df = 20$, $p < .001$), for the 11 JEFL speakers. The global foreign accent scores were based on Riney and Flege (1998) and a scale from 1 ("heavy foreign accent") to 9 ("no foreign accent"). All NE speakers (not shown in Figure 5) received a score of 8.5 to 9.0, whereas no JEFL speaker received a score higher than 6. (Not shown in Figure 5 is the 6 to 9 range for global foreign accent). Each of the 22 data

FIGURE 5
Global Foreign Accent and Japanese Flap Substitution



points in Figure 5 represents the intersection of one JEFL speaker's global foreign accent score and that speaker's corresponding percentage of Japanese flap substitutions. There are 22 data points because we treat the 11 JEFL speakers at T1 and T2 (separated by 42 months) as 22 speakers. The correlation reported above is based on treating the JEFL group as 22 individuals, with T1 and T2 collapsed. (Recall earlier that with reference to Figure 1 we reported that for the NJ group we found no difference between T1 and T2 with regard to percentage of Japanese flap substitutions.) The pattern in Figure 5 is generally the following: The more NE-like the accent, the fewer the Japanese flap substitutions, and the less NE-like the accent, the more the Japanese flap substitutions.

Speakers J1 and J8, who were excluded from the four *t*-tests reported above, are included in the computing of *r* here. Speakers J1 and J8 could be excluded from the four *t*-tests above on the grounds that they were already performing like NE speakers or near NE-speakers at T1 and therefore could not improve. That was not the case, however, with regard to their global foreign accent, for which they both were assessed as being far below NE speakers, all of whom scored in the 8.5 to 9.0 range for global foreign accent. Speaker J1's accent scores at T1 and T2 were 4.3 and 5.1, respectively; for speaker J8 the scores were 4.0 and 4.3. (See Riney & Flege, 1998.)

Discussion

Because no significant differences were found between Japanese flap substitutions between T1 vs. T2 (Figure 1), for target /r/ vs. /l/ (Figure 2), or in spontaneous vs. reading tasks (Figure 3), these three findings will not be discussed here. A significant difference was found with regard to onset type (singleton vs. cluster). Given the dominant CV (consonant-vowel) syllable structure of Japanese, in which the Japanese flap does not normally occur in a C_V environment, perhaps the JEFL speakers had more difficulty substituting Japanese flaps in English #C_V and #CC_V environments (neither permitted in Japanese) than in English #_V environments (permitted in Japanese). Rather than producing Japanese flaps in the English cluster environments, the JEFL speakers apparently either deleted the flaps or produced different phonetic structures that were not recognized as Japanese flaps by the Japanese rater.

Our central hypothesis for this investigation—that a significant negative correlation would exist between global foreign accent and Japanese

flap substitution—was supported. The more frequent the Japanese flap substitutions, the lower (worse) the English accent rating, and the less frequent the flaps, the higher (better) the accent. This finding, however, is based on only one native Japanese rater and requires additional support. Our next step will be to have a second Japanese rater make judgments on flap substitutions based on the same speakers, tasks, and recordings that we have used here. After that, we plan to investigate how suprasegmentals and other features of pronunciation (beyond VOT and liquids) in the same group of speakers are related to their global foreign accent.

Acknowledgment

We wish to thank Randy Thrasher and David Rackham for help with some of the statistical procedures used in this study. If any errors have escaped our notice, however, they are our own responsibility.

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